

Effect of Sensory Manipulations on Human Joint Stiffness Strategy and Its Adaptation for Human Dynamic Stability

Authors : Aizreena Azaman, Mai Ishibashi, Masanori Ishizawa, Shin-Ichiroh Yamamoto

Abstract : Sensory input plays an important role to human posture control system to initiate strategy in order to counterpart any unbalance condition and thus, prevent fall. In previous study, joint stiffness was observed able to describe certain issues regarding to movement performance. But, correlation between balance ability and joint stiffness is still remains unknown. In this study, joint stiffening strategy at ankle and hip were observed under different sensory manipulations and its correlation with conventional clinical test (Functional Reach Test) for balance ability was investigated. In order to create unstable condition, two different surface perturbations (tilt up-tilt (TT) down and forward-backward (FB)) at four different frequencies (0.2, 0.4, 0.6 and 0.8 Hz) were introduced. Furthermore, four different sensory manipulation conditions (include vision and vestibular system) were applied to the subject and they were asked to maintain their position as possible. The results suggested that joint stiffness were high during difficult balance situation. Less balance people generated high average joint stiffness compared to balance people. Besides, adaptation of posture control system under repetitive external perturbation also suggested less during sensory limited condition. Overall, analysis of joint stiffening response possible to predict unbalance situation faced by human.

Keywords : balance ability, joint stiffness, sensory, adaptation, dynamic

Conference Title : ICCB 2014 : International Conference on Computational Biomechanics

Conference Location : Istanbul, Turkey

Conference Dates : September 29-30, 2014